BATS IN THE GUNNISON GORGE NATIONAL CONSERVATION AREA AND WILDERNESS AND THE ESCALANTE STUDY AREA: RESULTS OF MIST-NETTING AND ACOUSTIC SURVEYS DURING 2009

Prepared for Melissa Siders, Biological Staff Supervisor

Uncompahgre Field Office

2465 S. Townsend Ave., Montrose CO 81401

Mark A. Hayes

School of Biological Sciences

Ross Hall

University of Northern Colorado

Greeley, CO

November 2009

INTRODUCTION

Western Colorado has a diverse bat fauna consisting of approximately 17 species (Fitzgerald et al.1994, Armstrong et al.1994, Adams 2003). The Bureau of Land Management's Colorado Uncompahgre Field Office lists Townsend's big-eared bat (*Corynorhinus townsendii*), spotted bat (*Euderma maculatum*), Allen's big-eared bat (*Idionycteris phyllotis*), fringed myotis (*Myotis thysanodes*), and Yuma myotis (*Myotis yumanensis*) as sensitive wildlife species (BLM 2007). Allen's big-eared bat has not been captured in Colorado, but was recently documented along La Sal Creek near the Paradox Valley area using recorded echolocation calls (Hayes et al. 2009). BLM biologists have an interest in learning more about the occurrence and distribution of sensitive bat species on lands managed by the Uncompahgre Field Office.

In 2009, eight days of mist-netting surveys and acoustic monitoring were completed in the BLM's Gunnison Gorge National Conservation Area and Wilderness and in the Escalante study area. The two main objectives of this study focused on: (1) performing continued mist-net capture and acoustic monitoring in the Colorado BLM's area of interest in the Gunnison Gorge National Conservation Area and Wilderness; and (2) performing preliminary mist-net capture and acoustic monitoring in the BLM's area of interest in the Escalante study area. This 2009 survey work was funded by the BLM's Uncompahgre Field Office in Montrose, Colorado.

The purpose of this report is to summarize the results of mist-net and acoustic sampling for bats in the Gunnison Gorge National Conservation Area and Wilderness, and in the Escalante study area during 2009. These areas are used by bats for roosting, foraging, and drinking, and the Bureau of Land Management's Uncompahgre Field Office has an interest in understanding the

species occurrence and diversity of bats using these areas, especially the occurrence and activities of bat species that are listed as sensitive wildlife species by this BLM field office. This sampling effort adds to the species inventories of these areas and will help increase knowledge of the ecology of bats in southwestern Colorado.

Field work in 2009 involved mist-net capture surveys and acoustic monitoring of bat echolocation calls. Mist-netting was conducted in areas likely to be visited by bats and consisted of placing mist-nets over or near water and along roads. Once captured, standard data were recorded including species, age class, and reproductive status. Echolocation calls of bats flying over the survey sites were recorded each night. Calls were analyzed using SonoBat™ software for bat call analysis.

METHODS AND MATERIALS

Mist-netting was conducted in areas likely to be visited by bats and consisted of placing mist-nets over or near water and along roads. Once captured, standard data were recorded including species, age class, and reproductive status. Bat echolocation calls emitted by free-flying bats at the sampling sites were recorded using a Pettersson Ultrasound Detector D240x (Pettersson Elektronik AB, Uppsala, Sweden) combined with an iRiver IFP-895 digital MP3 player/recorder (see Photo 11). Calls were analyzed using SonoBat™ 2.5.6 software for bat call analysis (DNDesign, Arcata, California). When adequate call information was available, call sequences were identified to species using echolocation call characteristics in comparison to reference information (Szewczak and Weller 2008, Szewczak 2008) and other known-species reference calls from western Colorado (Hayes, unpublished data). Call sequences without

adequate information, or that only included call fragments, were not identified. Accurate and reliable identification of bat species using echolocation call recordings often requires the compilation of extensive echolocation call libraries of known-species call sequences from the geographical area of interest. However, due to the current lack of such a comprehensive echolocation call library for southwestern Colorado and the difficulty of identifying some bat call sequences to species (especially *Myotis* species), this information should be used cautiously. For species where there is little or no ambiguity in species identification the number of call sequences recorded at a site is listed. Where appropriate I have added modifiers (such as "likely *Myotis yumanensis*") to the description of call sequences recorded at a sampling location. Where I felt confident in identifying *Myotis* species, I have listed number of passes recorded. The two *Myotis* species that are listed by the BLM as sensitive (*Myotis thysanodes* and *M. yumanensis*) generally have calls that are distinguishable from other species in western Colorado. Maps of capture locations are shown on Maps 1 and 2 below. Capture information from each site are shown in "Appendix A: Capture and Acoustic Recording Results" and summary information for all sites and species are shown in Table 1. For each capture location, the following information is included: survey location; date surveyed; UTM coordinates in North American Datum 1927 (NAD 27 CONUS); number and length of mist-net used; species, sex, age, weight, and reproductive status of each bat captured; genus and, when possible, species identity, of echolocation calls recorded during the survey.

Mark Hayes, Lea' Bonewell, Missy Siders, Meghan Rowe, and BLM river rangers Peter Dennett and Ryan Mathis conducted mist-netting and acoustic sampling in the Gunnison Gorge National Conservation Area and Wilderness from July 20 to July 22. Mark Hayes conducted

sampling in the Escalante area of interest from August 3 to 7; Meghan Rowe and Tony Cimaglio assisted with sampling on August 6.

RESULTS

Detailed results from mist-netting and acoustic surveys at each site are shown in "Appendix A: Capture and Acoustic Recording Results". Information in this appendix includes the site name, sampling date, sampling location using UTM coordinates, number and length of nets deployed, species captured, and sex, age, weight, and reproductive condition of each individual captured. The genus and, when possible, species identity, of echolocation calls recorded during the survey are also listed.

Gunnison Gorge National Conservation Area and Wilderness

In the Gunnison Gorge National Conservation Area and Wilderness, a total of 11 individual bats were captured and released on 3 nights from July 20 to 22, 2009. Four species were captured: western small-footed myotis (*Myotis ciliolabrum*), little brown or Occult myotis (*Myotis lucifugus* or *occultus*), Yuma myotis (*Myotis yumanensis*), and western pipistrelle (*Parastrellus* (*Pipistrellus*) *hesperus*). (Note: throughout the rest of this report, western pipistrelles will be referred to by the binomial "*Parastrellus hesperus*".) Of the bat species listed on the BLM's Colorado Uncompahgre Field Office sensitive wildlife species list, we captured one species, Yuma myotis (*Myotis yumanensis*). We captured 2 western small-footed myotis (18.2% of captures), 2 little brown or Occult myotis (18.2% of captures), 6 Yuma myotis (54.5% of captures), and 1 western pipistrelles (9.1% of captures). The proportion of females to males

captured was higher in little brown or Occult myotis (2F:0M) and western pipistrelle (1F:0M). The proportion of females to males captured was equal in western small-footed myotis (1F:1M) and Yuma myotis (3F:3M). Of 4 adult females captured, 1 was possibly pregnant, 2 were lactating, and 1 showed no obvious signs of being pregnant or lactating and was considered to be non-reproductive at the time of capture. Three of the females captured were juveniles. One of the males captured was an adult and did not show signs of descending testes. Three of the males were juveniles. There was an equal sex ratio of captured juveniles (3F:3M).

Echolocation call sequences consistent with 10 species were recorded within the sampling area: big brown bat (*Eptesicus fuscus*), spotted bat (*Euderma maculatum*), hoary bat (*Lasiurus cinereus*), silver-haired bat (*Lasionycteris noctivagans*), California myotis (*Myotis californicus*), western small-footed myotis (*Myotis ciliolabrum*), little brown or Occult myotis (*Myotis lucifugus* or *occultus*), Yuma myotis (*Myotis yumanensis*), big free-tailed bat (*Nyctinomops macrotis*), and western pipistrelle (*Parastrellus hesperus*). Of the bat species listed on the BLM's Colorado Uncompahgre Field Office sensitive wildlife species list, we recorded echolocation call sequences consistent with two species, spotted bat (*Euderma maculatum*) and Yuma myotis (*Myotis yumanensis*). No evidence of Allen's big-eared bat or fringed myotis was found during sampling of the Gunnison Gorge National Conservation Area and Wilderness.

Sounds were recorded that appear to be Townsend's big-eared bat (*Corynorhinus townsendii*) social calls (see Figure 16). However, more information will be needed to confirm that these are the social calls of this species. Also, 10 echolocation call sequences were recorded that could not be definitively identified, but that preliminarily look consistent with western red

bat (*Lasiurus blossevillii*) (see Figure 14). This species has not been documented in Colorado. See discussion for more details.

Escalante study area

In the Escalante study area, a total of 19 individual bats were captured and released on 5 nights from August 3 to 7, 2009. Seven species were captured: big brown bat (*Eptesicus fuscus*), silver-haired bat (*Lasionycteris noctivagans*), western small-footed myotis (*Myotis ciliolabrum*), little brown or Occult myotis (*Myotis lucifugus* or *occultus*), Yuma myotis (*Myotis yumanensis*), western pipistrelle (*Parastrellus hesperus*), and Mexican free-tailed bat (*Tadarida brasiliensis*). Of the bat species listed on the BLM's Colorado Uncompahgre Field Office sensitive wildlife species list, we captured 1 species (Yuma myotis) that is considered sensitive. We captured 3 big brown bats (15.8% of captures), 3 silver-haired bat (15.8% of captures), 1 western small-footed myotis (5.3% of captures), 2 little brown or Occult myotis (10.5% of captures), 6 Yuma myotis (31.6% of captures), 3 western pipistrelles (15.8% of captures), and 1 Mexican free-tailed bat (5.3% of captures). The proportion of females to males captured was higher in big brown bats (2F:1M), western small-footed myotis, (1F:0M), and Yuma myotis (3F:2M). The proportion of males to females captured was higher in silver-haired bat (0F:3M), little brown or Occult myotis (0F:2M), western pipistrelle (0F:4M), and Mexican free-tailed bat (0F:1M). Of 4 adult females captured, 2 were lactating, and 2 showed no obvious signs of being pregnant or lactating and were considered to be non-reproductive at the time of capture. Two of the females captured were juveniles and were both Yuma myotis. Three of the adult males captured were scrotal, two of which were silver-haired bats and one of which was a big brown bat. Three of the males were

juveniles. There were more male than female juveniles captured (2F:3M), and 4 of 5 juveniles captured were Yuma myotis.

Echolocation call sequences consistent with 12 species were recorded within the sampling area: Townsend's big-eared bat (*Corynorhinus townsendii*), big brown bat (*Eptesicus fuscus*), hoary bat (*Lasiurus cinereus*), silver-haired bat (*Lasionycteris noctivagans*), California myotis (*Myotis californicus*), western small-footed myotis (*Myotis ciliolabrum*), little brown or Occult myotis (*Myotis* or *occultus*), fringed myotis (*Myotis thysanodes*), Yuma myotis (*Myotis yumanensis*), big free-tailed bat (*Nyctinomops macrotis*), western pipistrelle (*Parastrellus hesperus*), and Mexican free-tailed bat (*Tadarida brasiliensis*). Of the bat species listed on the BLM's Colorado Uncompahgre Field Office sensitive wildlife species list, we recorded echolocation call sequences consistent with two species, Townsend's big-eared bat (*Corynorhinus townsendii*) and Yuma myotis (*Myotis yumanensis*). Echolocation calls were also recorded that may have been pallid bat (*Antrozous pallidus*).

As with the Gunnison Gorge study area, echolocation call sequences were recorded that could not be definitively identified, but that preliminarily appear to be consistent with western red bat (*Lasiurus blossevellii*) (see Figure 14). Seventeen files consistent with this species were recorded, 7 at the Escalante Boat Launch Bridge and 10 at Escalante Forks. This species has not been documented in Colorado. See discussion for more details.

No evidence of Allen's big-eared bat was found during sampling of the Gunnison Gorge National Conservation Area and Wilderness or the Escalante study area.

Figures 1 – 14 show spectrographs of the bat species recorded in both study areas. These figures are organized alphabetically by species names. Social calls of presumed Yuma myotis and Townsend's big-eared bats are shown in Figures 15 and 16.

Species captured and recorded at each location in the Gunnison Gorge National Conservation Area and Wilderness (Big Eddy, Teepee, and Smith Fork) and in the BLM's Escalante area of interest (Escalante Camp #2, Escalante Bridge, Escalante Forks, Escalante Rim, and Club Park Cattle Pond) during 2009 are shown in Table 1. A bar graph comparing the proportion of species captured using mist-netting and acoustic recording techniques for each survey location is shown in Figure 17. Photographs of some of the survey locations and equipment can be found at the end of the report.

DISCUSSION

Sampling of the bat fauna in Gunnison Gorge National Conservation Area and Wilderness (GGNCA) documented the presence of 13 species. Four of the bat species listed on the BLM's Colorado Uncompahgre Field Office sensitive wildlife species list were documented in these two sampling areas. Echolocation calls consistent with Townsend's big-eared bat were recorded in the Escalante area at Escalante Forks, and social calls that are consistent with this species were recorded at the Big Eddy and Teepee Ranger Camp sites in the Gunnison Gorge and at the Escalante Boat Launch Bridge in the Escalante study area. Spotted bats were not captured during this sampling effort, but echolocation calls were recorded at the Big Eddy site in the Gunnison Gorge. This species was not recorded at any of the other sites, but its audible calls were heard at all three GGNCA sites. Yuma myotis was captured in both study areas at the

Teepee, Smith Fork, Escalante Bridge, Escalante Forks, and Escalante Rim sites. Echolocation calls consistent with Yuma myotis were recorded in both the GGNCA and the Escalante study area. Fringed myotis was not captured, but echolocation calls consistent with this species were recorded only at the Escalante Forks site. One sensitive species, Allen's big-eared bat, was not captured and echolocation calls consistent with these species were not recorded.

Bat activity was observed at all 8 sites. During 3 nights of survey work in the GGNCA, between 1 and 4 species were captured nightly using mist-netting and between 7 and 9 species were identified using acoustic recording techniques. The highest species richness in the GGNCA using mist-netting was at the Smith Fork site, while the highest species richness using acoustic monitoring was at the Teepee Ranger Camp site. During 5 nights of survey work in the Escalante study area, between 0 and 7 species were captured using mist-netting and between 1 and 11 species were identified using acoustic recording techniques. The highest species richness using both mist-netting and acoustic recording was documented at the Escalante Forks site.

Spotted bats were not captured during this sampling effort, and their echolocation calls were recorded only at the Big Eddy camp site in the GGNCA. However, spotted bats were heard audibly at all three GGNCA sites. It is probable that these bats are roosting in the high cliff walls of the Gunnison Gorge. I suspect that more intensive acoustic recording over a longer time period would reveal significant spotted bat activity in the GGNCA. Spotted bats were not recorded during sampling in the Escalante study area.

Yuma myotis were captured, and echolocation calls consistent with this species were recorded, in the GGNCA and the Escalante study area. Twelve Yuma myotis were captured, including 3 adult females, 9 juveniles, and one bat that escaped before sex and age could be

determined. Of the adult females captured, 2 were lactating and 1 was possibly pregnant. Reproductive females and/or juveniles were captured at 4 sites (Teepee Ranger Camp, Smith Fork, Escalante Boat Launch Bridge, and Escalante Rim) suggesting that maternity colonies of this species are near these sites. There appears to be a large maternity roost of Yuma myotis using the Escalante Boat Launch Bridge (see photos 5 and 6). Numerous Yuma myotis were observed emerging from a crevice within the concrete structural supports of the bridge, and fresh guano was observed under the bridge. A 6-meter mist-net was set under this bridge and 3 Yuma myotis were captured (1 adult lactating female and 2 juvenile females). Numerous echolocation calls of this species were recorded at the site. This roost site would be an excellent location for an infrared video survey, which would allow researchers to monitor bats emerging from the roost and conduct exit counts. This species is highly associated with the presence of open water and in Colorado is usually captured over open water and in riparian areas (Armstrong et al. 1994, Fitzgerald et al. 1994, Adams 2003). It is likely that the persistence of this species in Colorado will in the long term depend on suitable and predictably available water resources.

Fringed myotis were not captured during this sampling effort, but 1 echolocation call sequence consistent with this species was recorded at Escalante Forks. This species is known to inhabit piñon-juniper woodlands and ponderosa pine forests in western Colorado (Armstrong et al. 1994, Fitzgerald et al. 1994, Adams 2003, Navo pers. comm.). In the Front Range of the Southern Rocky Mountains this species forms maternity roosts in rock crevices, abandoned mines, and occasionally in buildings and cabins (Adams 2003, Hayes unpublished data). Little is known, however, about the roosting preferences of this species in western Colorado. Of the

Myotis species in western Colorado, fringed myotis have a distinctive echolocation call that is readily identifiable if good echolocation call sequences are available.

Townsend's big-eared bat is a species of significant conservation concern in the southwestern United States. This species was not captured during this survey, but echolocation calls consistent with this species were recorded at the Escalante Forks site. At Big Eddy, Teepee Ranger Camp, and Escalante Boat Launch Bridge sites, social calls were recorded that appear to be consistent with Townsend's big-eared bats. However, I do not yet have call files available to definitively identify these sequences to species. There are only about 15 known maternity roosts of this species in Colorado (K. Navo, pers. comm.). Continued identification and protection of maternity sites in western Colorado may be important to the long-term persistence of populations of this species within Colorado and other States in the 4-Corner's region.

The five bat species listed by the BLM's Uncompahgre Field Office as sensitive wildlife species are identifiable using echolocation call recordings. The continued use of echolocation call recording and analysis will be an important tool in evaluating the occurrence and habitat associations of sensitive bat species in southwestern Colorado.

Several other observations were made during this survey work. We captured a female western small-footed myotis in a net set at the opening of a small cave feature at the Big Eddy camp site. Presumed western small-footed myotis were observed flying around and possibly emerging from rock crevices above this cave. We did not capture a reproductively active female of this species, but it is possible that a maternity roost of this species occurs in rock crevices near this cave.

Presumed big free-tailed bat calls were heard and recorded at 5 sites. Little is known about this species in Colorado, but Navo and Gore (2001) proposed that this species is more widespread and common than is generally suggested in the Colorado bat literature (see for example, Armstrong et al. 1994, Fitzgerald et al. 1994, Adams 2003). Continued capture and acoustic surveys in western Colorado will help improve knowledge of this species' natural history and distribution in Colorado.

The Escalante Camp site looks like a good site for capturing and recording bats. However, only one species was captured and recorded. The night this site was surveyed was quite windy, which likely affected bat activity levels and captures. This site is near cliff walls and piñon-juniper woodlands, and would be expected to be a productive survey location. The Club Park Pond also looks like a good mist-net location, but the evening this site was surveyed was also quite breezy.

Western pipistrelles were commonly seen, captured, and recorded during these surveys. In the GGNCA, a number of presumed pipistrelles were observed flying near a rock face down river from the Teepee Ranger Camp site and it is possible that there is a maternity roost in this area.

Echolocation call sequences that could not be definitively identified were recorded at the Smith Fork (10 sequences), Escalante Bridge (7 sequences), and Escalante Forks (10 sequences) sites. These 27 call sequences preliminarily look consistent with western red bat (*Lasiurus blossevillii*) based on known species recordings included in the SonoBat echolocation call library of western North American bat species (Szewczak 2008). This species is known from eastern Utah, especially in association with major riparian corridors, but has not been documented in

Colorado. It is possible that this species moves along the Colorado River and other riparian corridors into western Colorado.

ACKNOWLEDGEMENTS

The support, assistance, and expertise of Missy Siders (BLM Biologist, Uncompahgre Field Office) are very much appreciated. Lea' Bonewell (USGS Biologist, Fort Collins Science Center), Meghan Rowe, and BLM river rangers Peter Dennett and Ryan Mathis assisted with mist-netting and acoustic sampling in the Gunnison Gorge National Conservation Area and Wilderness. Meghan Rowe and Tony Cimaglio assisted with sampling in the Escalante study area.

LITERATURE CITED

ADAMS, R. A. 2003. Bats of the Rocky Mountain West: Natural History, Ecology, and Conservation. University Press of Colorado, Boulder.

ARMSTRONG, D. M., R. A. ADAMS, and J. FREEMAN. 1994. Distribution and ecology of bats of Colorado. University of Colorado Museum, Natural History Inventory of Colorado, No. 15:1-83.

BUREAU OF LAND MANAGEMENT. 2007. BLM Colorado sensitive wildlife species of the Uncompahgre Field Office. http://www.blm.gov/co/st/en/fo/ufo/wildlife_and_vegetation/sensitive_wildlife.html

FITZGERALD, J. P., C. A. MEANEY and D. M. ARMSTRONG. 1994. Mammals of Colorado. Denver Museum of Natural History and University Press of Colorado, Niwot.

HAYES, M. A., K. W. NAVO, L. R. BONEWELL, C. J. MOSCH, AND R. A. ADAMS. 2009. Allen's big-eared bat (*Idionycteris phyllotis*) documented in Colorado based on its distinctive echolocation call. The Southwestern Naturalist 54(4):501-503.

HAYES, M. A. 2008. Bats in the Paradox Valley and Gunnison Gorge National Conservation Area: results of mist-netting and acoustic monitoring in 2008. File report for BLM's Uncompahgre Field Office.

NAVO, K. S., AND J. A. GORE. 2001. Distribution of the big free-tailed bat (*Nyctinomops macrotis*) in Colorado. The Southwestern Naturalist 46(3):370-376.

SZEWCZAK, J. M. and T. J. WELLER. 2008. Echolocation call characteristics of western bats. Sonobat bat echolocation characteristics key.

SZEWCZAK, J. M. 2008. Western US reference views, compiled January 2008. SonoBat bat echolocation reference calls.

APPENDIX A: Capture and Acoustic Recording Results

GUNNISON GORGE NATIONAL CONSERVATION AREA AND WILDERNESS SURVEYS

Big Eddy, Camp # 2, July 20 2009

UTM Coordinates: 13S/0253076/4279256; 5,406 ft.; Mist nets used: 1x3m, 2x6m.

Species	Sex	Age	Weight	Reproductive Status
Myotis ciliolabrum	Female	Adult	3.8g	Non-reproductive

Acoustic calls recorded: multiple *Eptesicus fuscus,* 9 *Euderma maculatum,* 4 *Lasionycteris noctivagans,* multiple *Lasiurus cinereus,* numerous *Myotis californicus,* numerous *Myotis ciliolabrum,* numerous *Myotis yumanensis,* 6 presumed *Nyctinomops macrotis,* and numerous *Parastrellus hesperus* call sequences recorded. Note: A sequence of presumed social calls were recorded that are possible *Corynorhinus townsendii*.

Bats Captured: 1; Species captured: 1; Species recorded: At least 8.

Teepee Ranger Camp, July 21 2009

UTM Coordinates: 13S/0252404/4284757; 5,358 ft.; Mist nets used: 3x6m.

Species	Sex	Age	Weight	Reproductive Status
Myotis yumanensis	Female	Juvenile	5.3g	Non-reproductive
Myotis yumanensis	Female	Adult	8.0g	Lactating

Acoustic calls recorded: several *Eptesicus fuscus,* 3 *Lasionycteris noctivagans,* 6 *Lasiurus cinereus,* multiple *Myotis californicus,* multiple *Myotis ciliolabrum,* 1 presumed *Myotis lucifugus* or *occultus,* 8 *Myotis yumanensis,* 2 presumed *Nyctinomops macrotis,* and numerous *Parastrellus hesperus* call sequences recorded. Note: As with Big Eddy, a sequence of presumed social calls were recorded that look like are possible *Corynorhinus townsendii*.

Bats Captured: 2; Species captured: 1; Species recorded: At least 9.

Smith Fork, July 22 2009

UTM Coordinates: 13S/02533261/4291222; 5,141 ft.; Mist nets used: 3x6m.

Species	Sex	Age	Weight	Reproductive Status
Myotis ciliolabrum	Male	Adult	4.8g	Non-scrotal
Myotis lucifugus or *occultus*	Female	Juvenile	5.8g	Non-reproductive
Myotis lucifugus or *occultus*	Female	Juvenile	6.3g	Non-reproductive
Myotis yumanensis	Male	Juvenile	5.8g	Non-reproductive
Myotis yumanensis	Male	Juvenile	5.5g	Non-reproductive
Myotis yumanensis	Male	Juvenile	4.9g	Non-reproductive
Myotis yumanensis	Female	Adult	7.3g	Possibly pregnant
Parastrellus hesperus	Female	Adult	6.1g	Lactating

Acoustic calls recorded: several *Eptesicus fuscus,* 2 *Lasionycteris noctivagans,* 4 *Lasiurus cinereus,* 7 *Myotis californicus,* 1 *Myotis ciliolabrum,* 1 presumed *Myotis lucifugus* or *occultus,* and 5 *Myotis yumanensis* call sequences recorded. Notes: 10 call sequences were recorded that could not definitively be identified and that preliminarily look consistent with Western red bat (*Lasiurus blossevillii*). See discussion for more information. This site exhibited the least acoustic activity of the 3 Gunnison Gorge sites in 2009. This is likely due to the placement of the detector on a rock overlook just up-stream of the Smith Fork confluence where there was more background noise from water flowing among the rocks along Smith Fork. In the future, more activity would likely be recorded if the detector is placed away from the white noise generated by the creek.

Bats Captured: 8; Species captured: 4; Species recorded: ~7.

ESCALANTE STUDY AREA

Escalante Camp # 2, August 3 2009

UTM Coordinates: 12S/0733172/4283786; 5,442 ft; Mist nets used: 2x6m.

Species	Sex	Age	Weight	Reproductive Status
Parastrellus hesperus	Male	Adult	3.9g	Non-scrotal
Parastrellus hesperus	Male	Adult	4.1g	Non-scrotal

Acoustic calls recorded: 2 *Lasiurus cinereus* call sequence recorded.

Bats Captured: 2; Species captured: 1; Species recorded: 1.

Escalante Boat Launch Bridge, August 4 2009

UTM Coordinates: 12S/0738322/4293310; 4,830 ft; Mist nets used: 1x6m.

Species	Sex	Age	Weight	Reproductive Status
Myotis yumanensis	Female	Adult	7.3g	Lactating
Myotis yumanensis	Female	Juvenile	no weight	Non-reproductive
Myotis yumanensis	Female	Juvenile	4.9g	Non-reproductive

Acoustic calls recorded: 2 *Lasionycteris noctivagans*, 1 *Lasiurus cinereus*, 2 presumed *Myotis lucifugus* or *occultus*, numerous *Myotis yumanensis*, 2 presumed *Nyctinomops macrotis*, and numerous *Parastrellus hesperus* call sequences recorded. Notes: Several sequences of presumed *Corynorhinus townsendii* social calls were recorded; 7 call sequences were recorded that could not definitively be identified and that preliminarily look consistent with Western red bat (*Lasiurus blossevillii*). See discussion for more information.

Bats Captured: 3; Species captured: 1; Species recorded: At least 6.

Escalante Forks, August 5 2009

UTM Coordinates: 12S/0726776/4278434; 6,122 ft; Mist nets used: 2x6m.

Species	Sex	Age	Weight	Reproductive Status
Eptesicus fuscus	Female	Adult	No Weight	Non-reproductive
Eptesicus fuscus	Female	Adult	No Weight	Non-reproductive
Eptesicus fuscus	Male	Adult	17.7g	Scrotal
Lasionycteris noctivagans	Male	Adult	8.8g	Scrotal
Lasionycteris noctivagans	Male	Adult	8.8g	Scrotal
Lasionycteris noctivagans	Male	Adult	No weight	Non-scrotal
Myotis ciliolabrum	Female	Adult	5.7g	Lactating
Myotis lucifugus or *occultus*	Male	Adult	6.0g	Non-scrotal
Myotis lucifugus or *occultus*	Male	Adult/late Juv	6.4g	Non-scrotal
Myotis yumanensis	Escaped while extracting another bat from the net			
Parastrellus hesperus	Male	Juvenile	No weight	Non-reproductive
Tadarida brasiliensis	Male	Adult	11.1g	Non-scrotal

Acoustic calls recorded: 3 presumed *Antrozous pallidus*, 4 *Corynorhinus townsendii,* 1 *Eptesicus fuscus*, numerous *Lasionycteris noctivagans*, numerous *Lasiurus cinereus*, numerous *Myotis californicus*, 1 *Myotis ciliolabrum*, 2 presumed *Myotis lucifugus* or *occultus*, 1 *Myotis thysanodes*, 10 presumed *Nyctinomops macrotis*, and 8 *Parastrellus hesperus*, and 3 *Tadarida brasiliensis*, call sequences recorded. Note: 10 call sequences were recorded that could not definitively be identified and that preliminarily look consistent with Western red bat (*Lasiurus blossevillii*). See discussion for more information.

Bats Captured: 12; Species captured: 7; Species recorded: At least 12.

Escalante Rim, August 6 2009

UTM Coordinates: 12S/0737513/4289405; 4,965 ft; Mist nets used: 3x6m.

Species	Sex	Age	Weight	Reproductive Status
Myotis yumanensis	Male	Juvenile	4.8g	Non-scrotal
Myotis yumanensis	Male	Juvenile	5.4g	Non-scrotal

Acoustic calls recorded: 1 *Lasionycteris noctivagans*, 2 *Lasiurus cinereus*, 1 *Myotis californicus*, 1 presumed *Nyctinomops macrotis*, and 1 *Parastrellus hesperus* call sequences recorded.

Bats Captured: 2; Species captured: 1; Species recorded: 5.

Club Park Cattle Pond, August 7 2009

UTM Coordinates: 12S/0742830/4286511; 5,512 ft; Mist nets used: 2x6m.

Species	Sex	Age	Weight	Reproductive Status

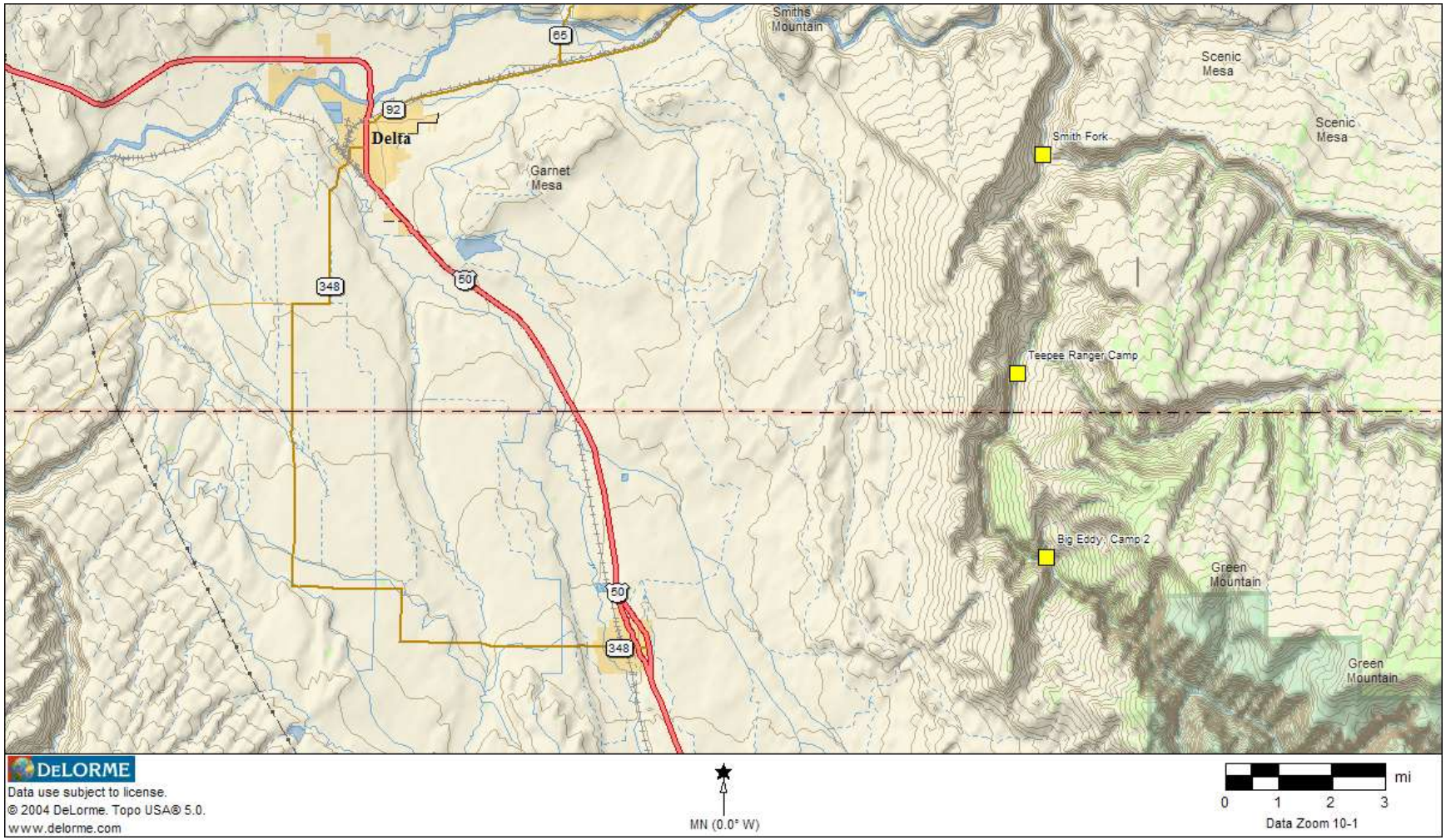
No captures

Acoustic calls recorded: 2 *Lasiurus noctivagans* call sequences recorded.

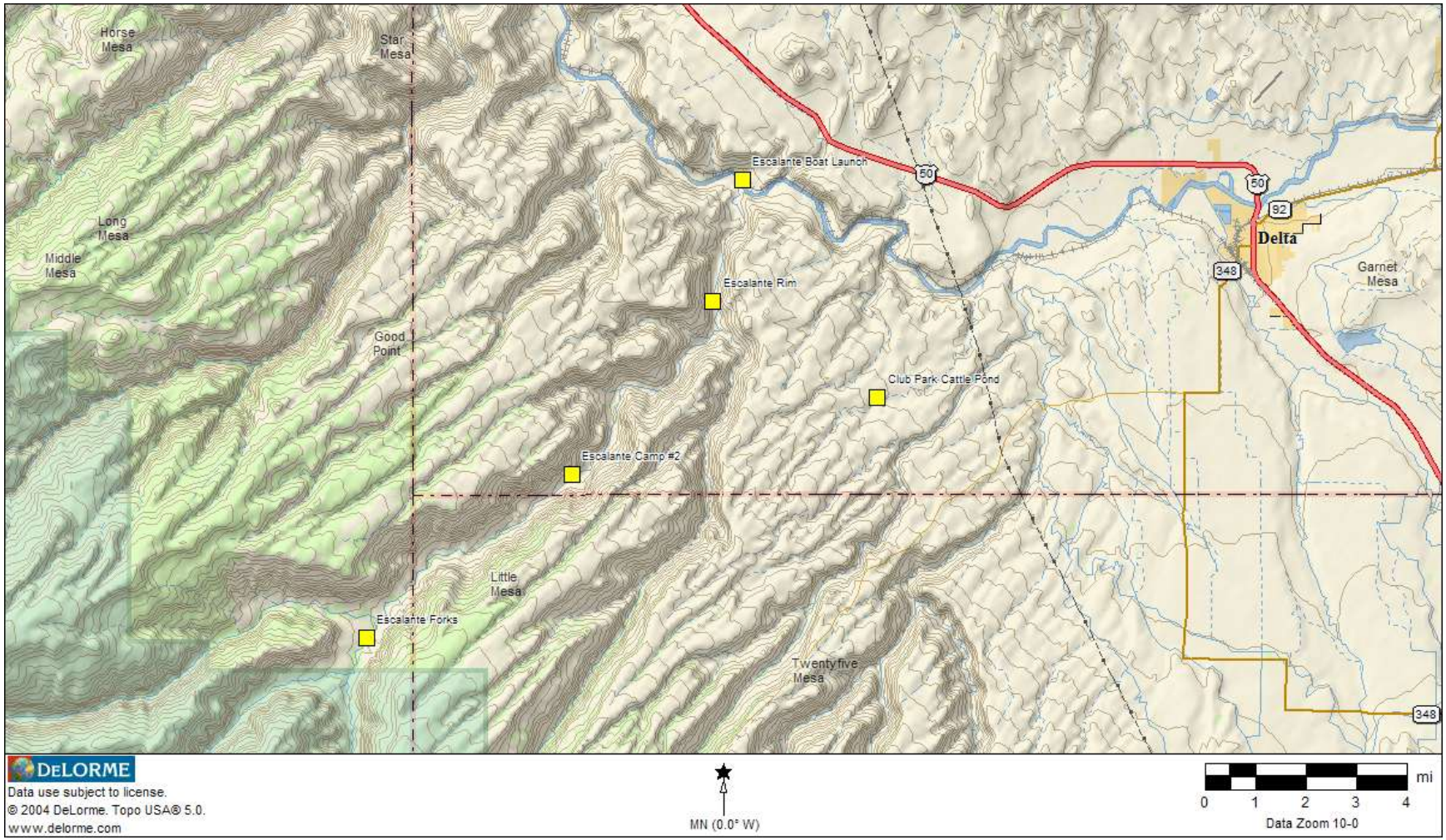
Bats Captured: 0; Species captured: 0; Species recorded: 1

TABLE 1. Species captured and recorded at each location in the Gunnison Gorge National Conservation Area and Wilderness (Big Eddy, Teepee, and Smith Fork) and in the BLM's Escalante area of interest (Escalante Camp #2, Escalante Bridge, Escalante Forks, Escalante Rim, and Club Park Cattle Pond) during 2009. "C" means captured at this site, "R" means recorded, and "R?" means possibly, but not definitively, recorded.

SPECIES	Big Eddy	Teepee	Smith Fork	Escalante Camp #2	Escalante Bridge	Escalante Forks	Escalante Rim	Club Park Cattle Pond	TOTAL SITES
ANPA						R?			C=0/R=0-1
COTO	R?	R?			R?	R			C=0/R=1-4
EPFU	R	R	R			C/R			C=1/R=4
EUMA	R								C=0/R=1
LACI	R	R	R	R	R	R	R		C=0/R=7
LANO	R	R	R		R	C/R	R	R	C=1/R=7
MYCA	R	R	R			R	R		C=0/R=5
MYCI	C/R	R	C/R			C/R			C=3/R=4
MYLU/OC		R	C/R		R	C/R			C=2/R=4
MYTH						R			C=0/R=1
MYYU		C/R	C/R		C/R	C	C		C=5/R=3
NYMA	R	R			R	R	R		C=0/R=5
PAHE	R	R	C	C	R	C/R	R		C=3/R=5
TABR						C/R			C=1/R=1
LABO?			R?		R?	R?			C=0/R=3?
TOTAL SPECIES	C=1/R=8+	C=1/R=9+	C=4/R=7+	C=1/R=1	C=1/R=6	C=7/R=11	C=1/R=5	C=0/R=1	



Map 1: Mist-net and acoustic locations in the Gunnison Gorge National Conservation area and Wilderness July 20 to July22, 2009.



Map 2: Mist-net and acoustic survey locations in the Escalante study area, August 3 to 7, 2009.

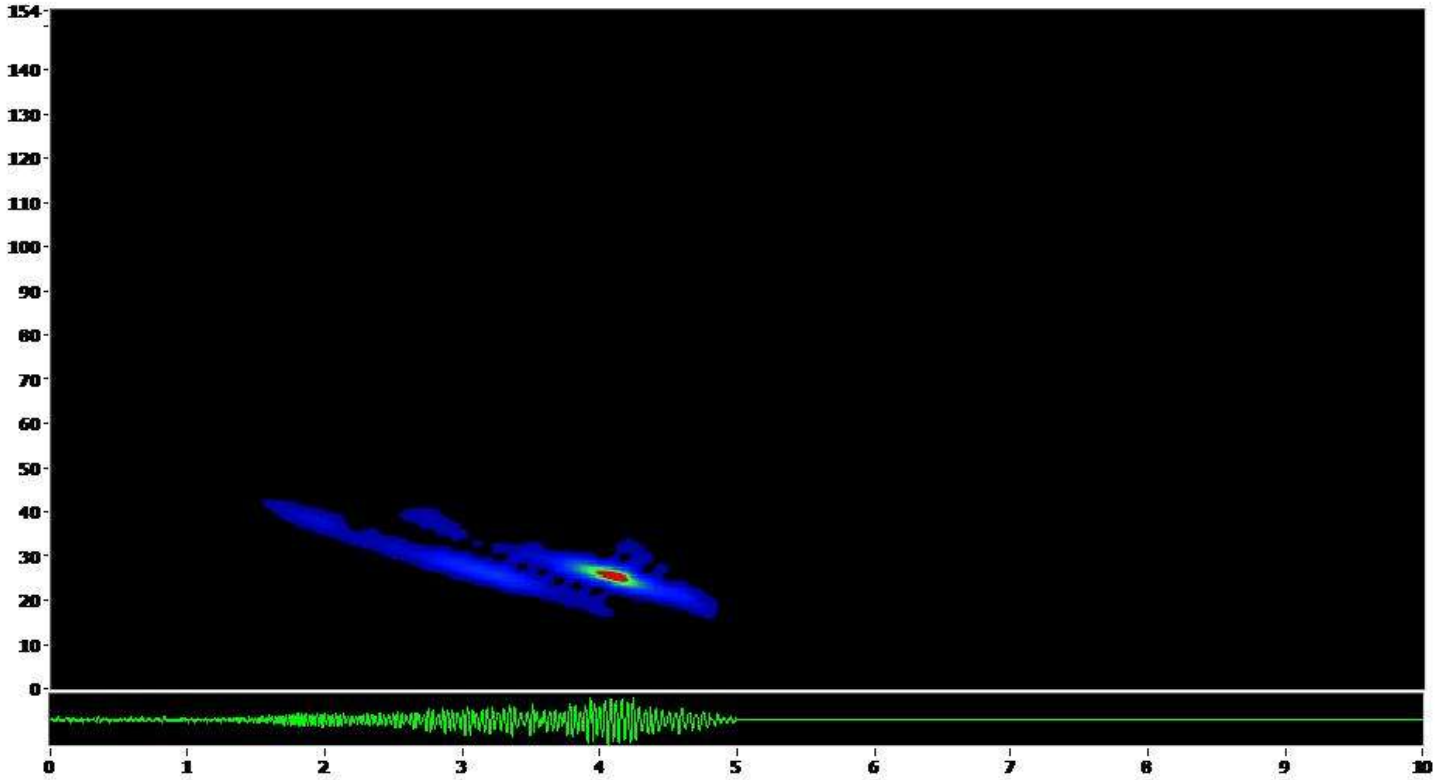


Figure 1. Spectrograph of a Townsend's big-eared bat (*Corynorhinus townsendii*) echolocation call recorded at Escalante Forks on August 5, 2009.

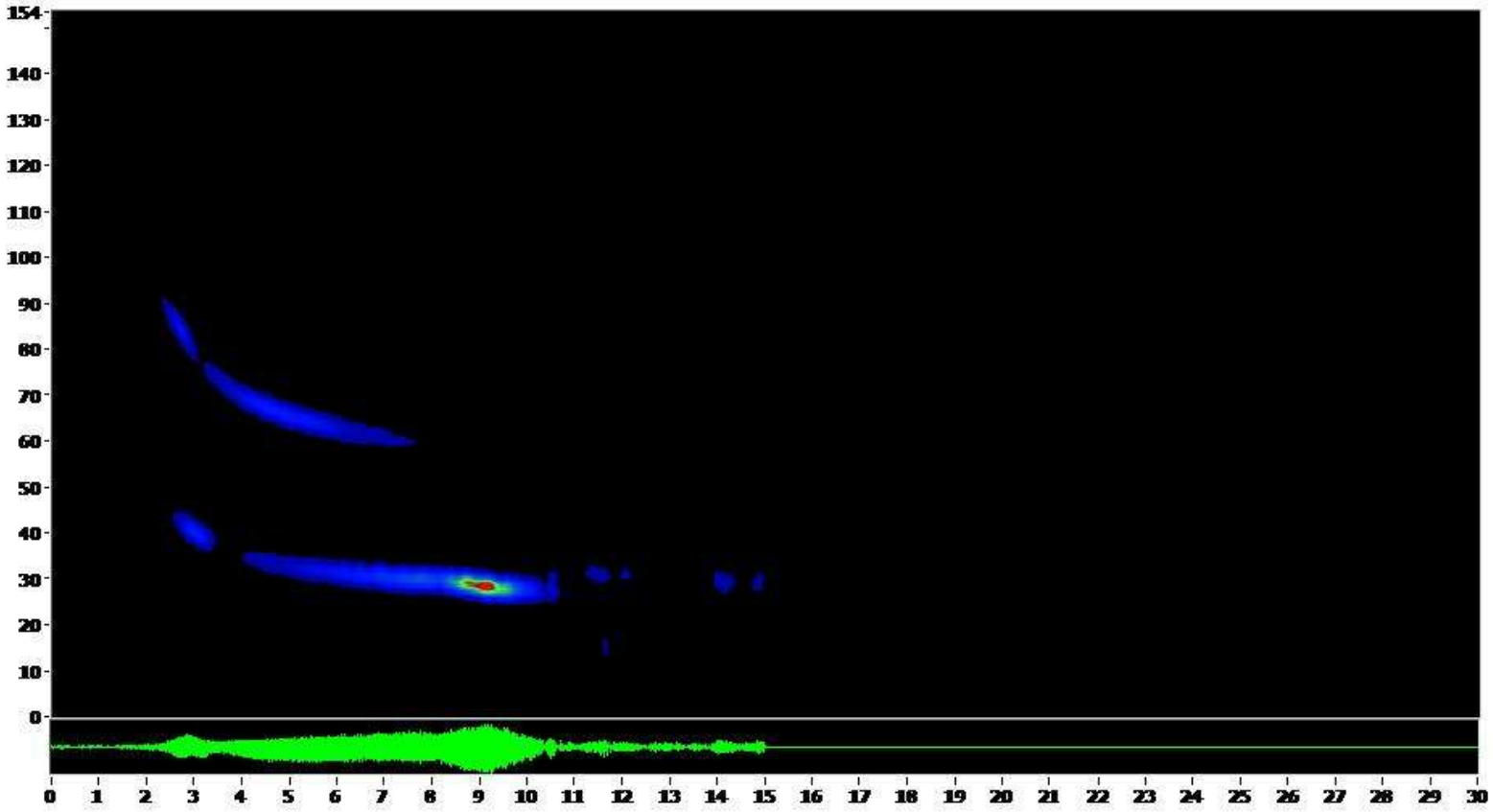


Figure 2. Spectrograph of a big brown bat (*Eptesicus fuscus*) echolocation call recorded at Escalante Forks on August 5, 2009.

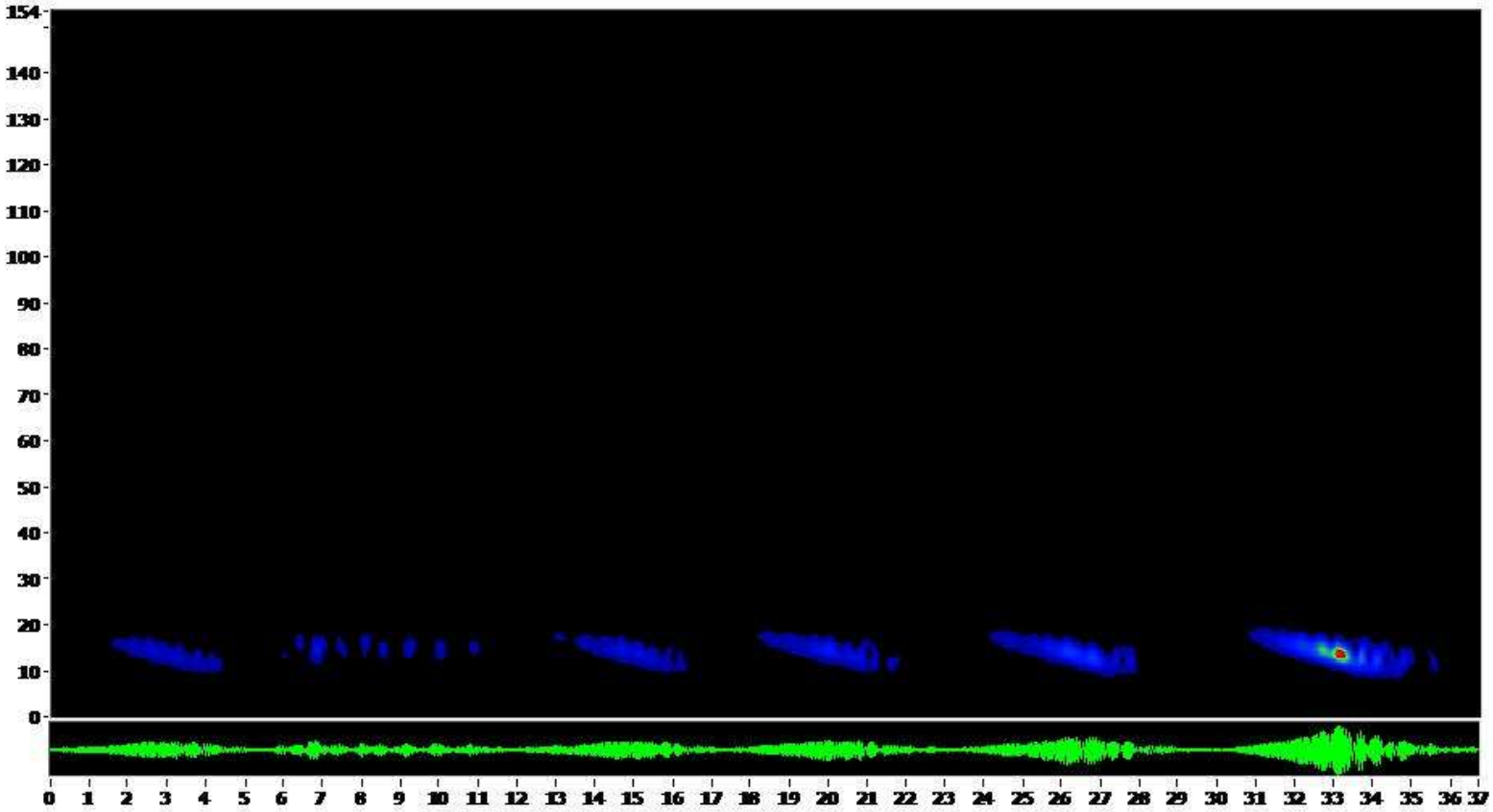


Figure 3. Spectrograph of a spotted bat (*Euderma maculatum*) echolocation call sequence recorded at Big Eddy Camp #2 on July 20, 2009.

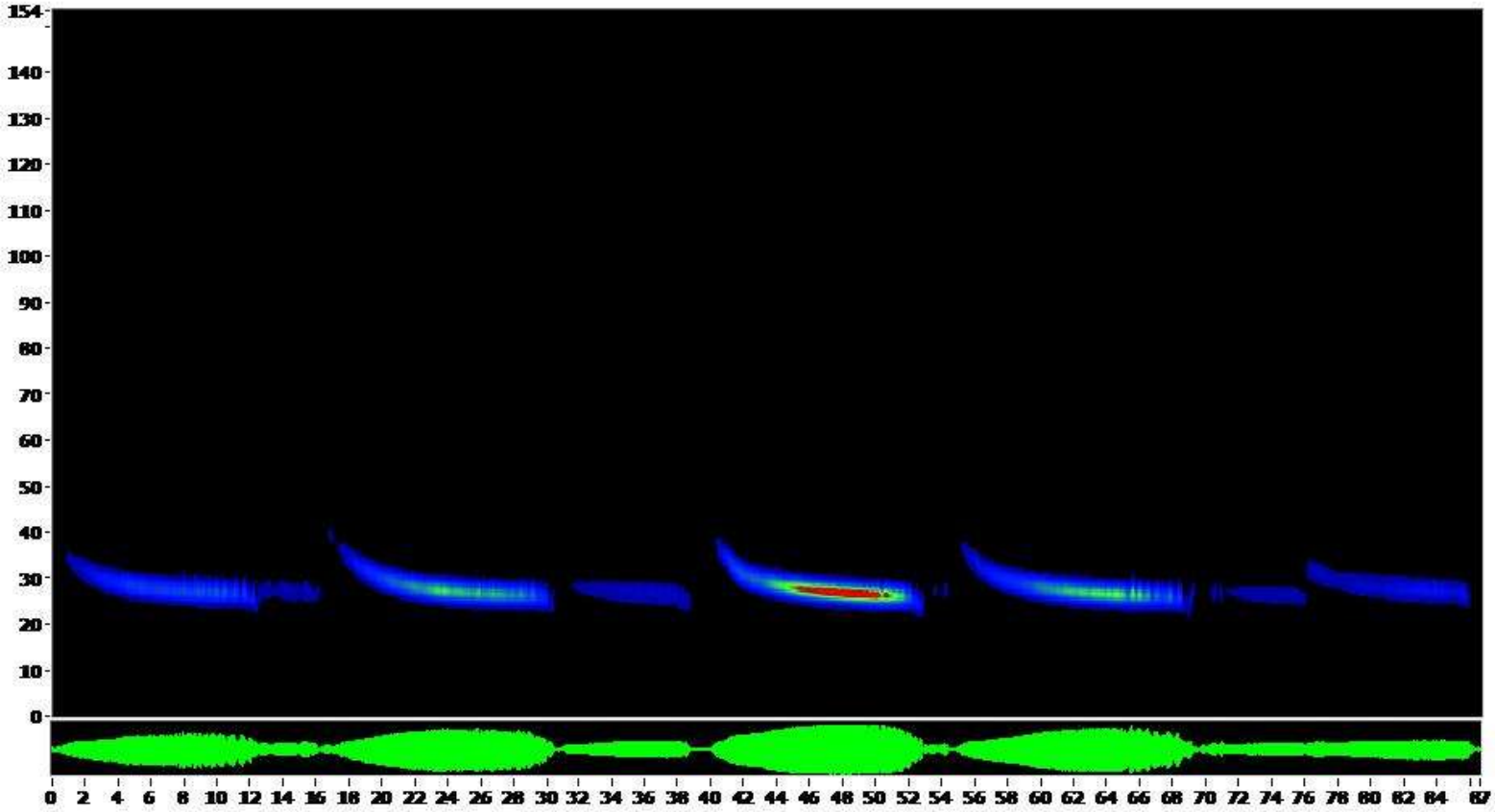


Figure 4. Spectrograph of a silver-haired bat (*Lasionycteris noctivagans*) echolocation call sequence recorded at Escalante Forks on August 5, 2009.

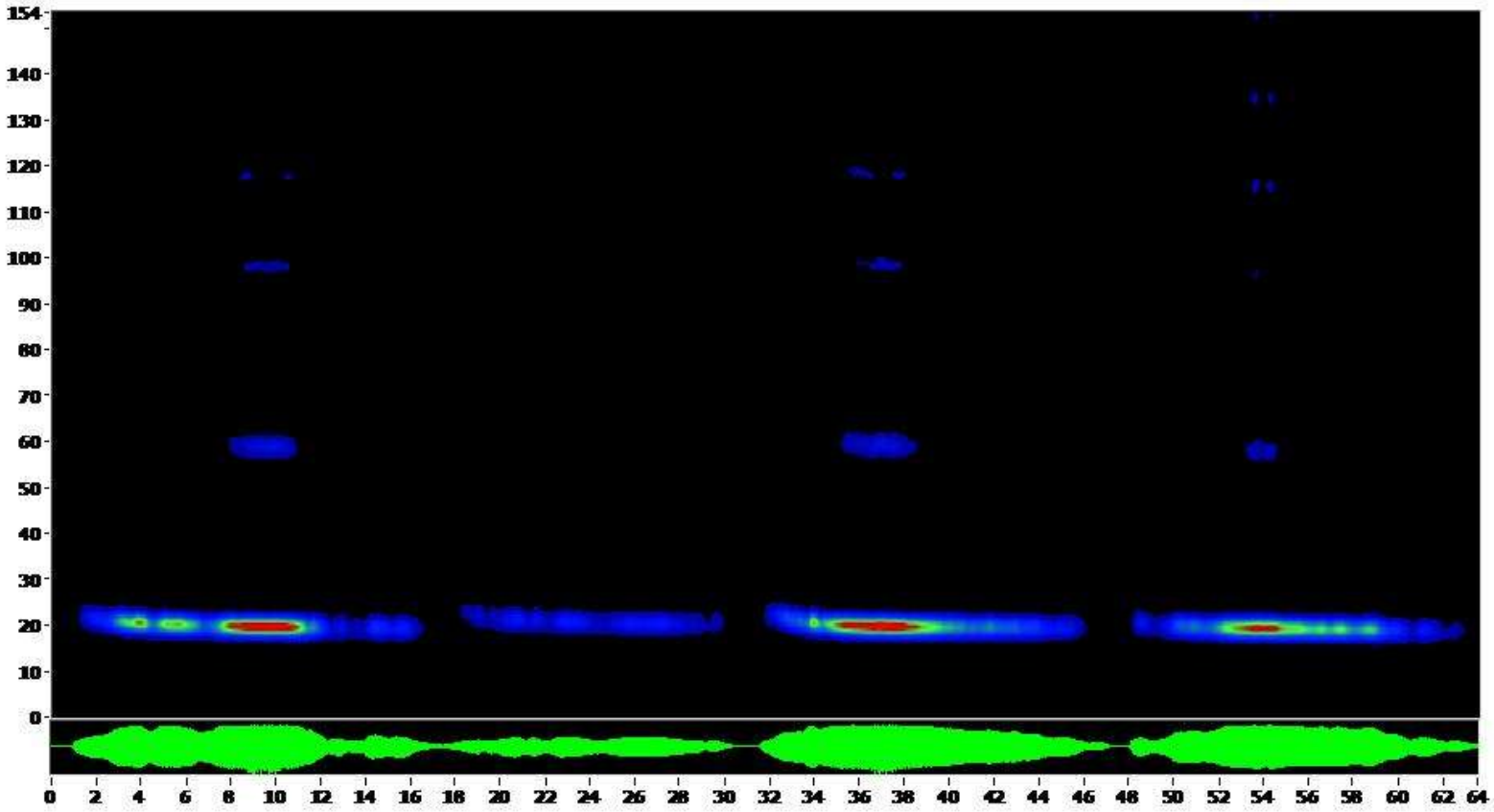


Figure 5. Spectrograph of a hoary bat (*Lasiurus cinereus*) echolocation call sequence recorded at Big Eddy Camp # 2 on July 20, 2009.

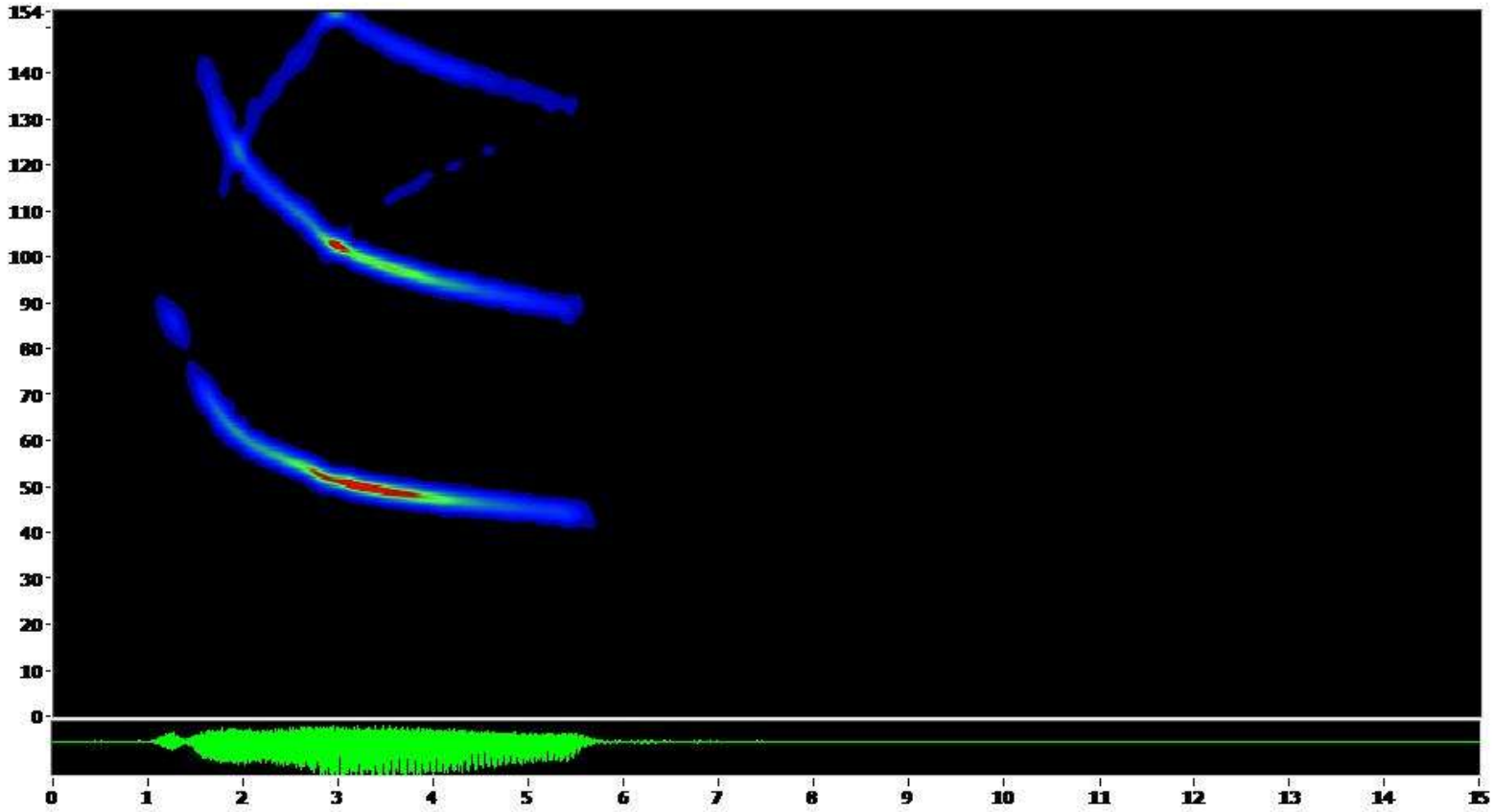


Figure 6. Spectrograph of a California myotis (*Myotis californicus*) echolocation call recorded at Escalante Rim on August 6, 2009.

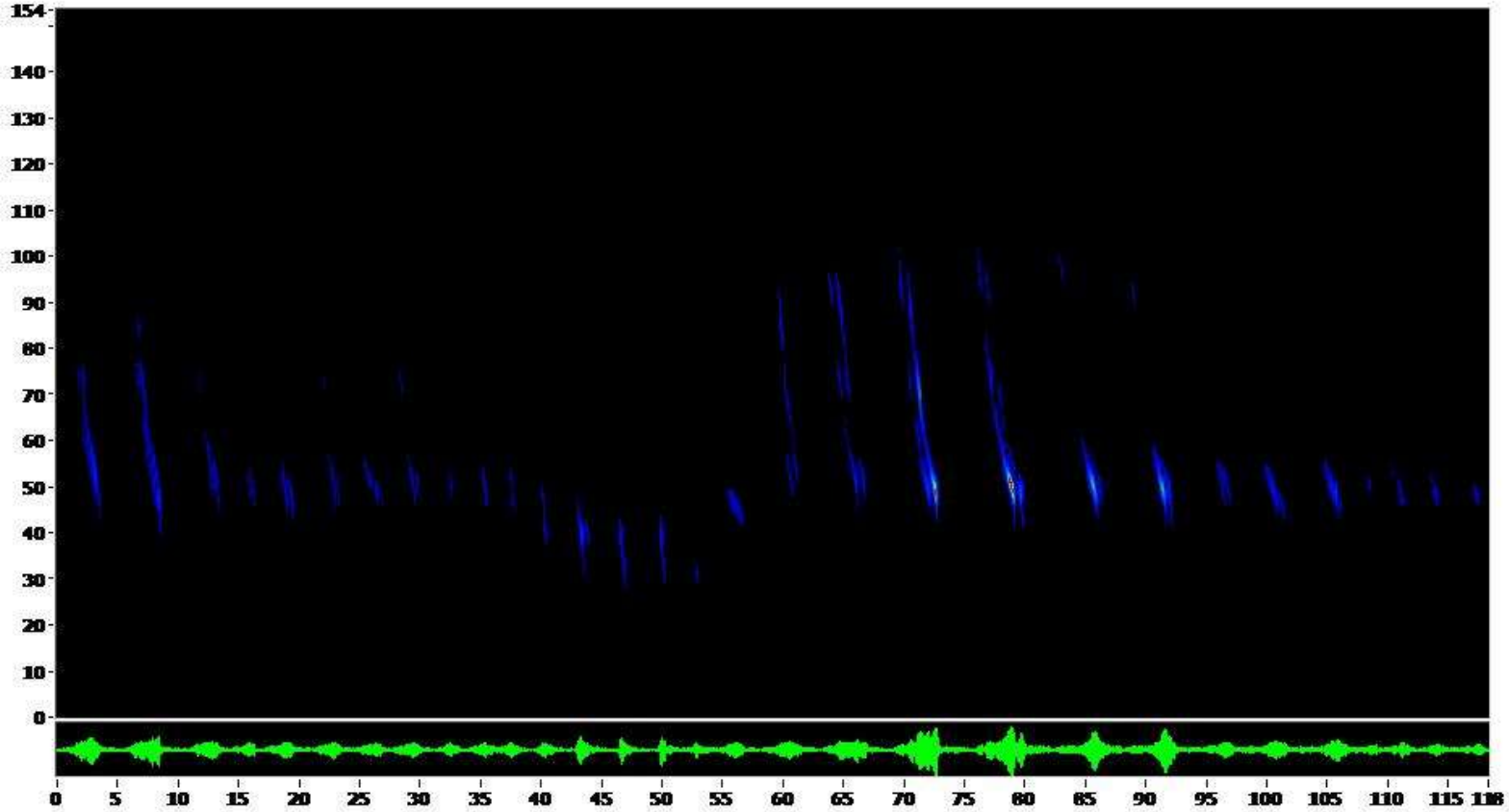


Figure 7. Spectrograph of a western small-footed myotis (*Myotis ciliolabrum*) echolocation call sequence recorded at Big Eddy Camp #2 on July 20, 2009. Note that this sequence includes a feeding buzz.

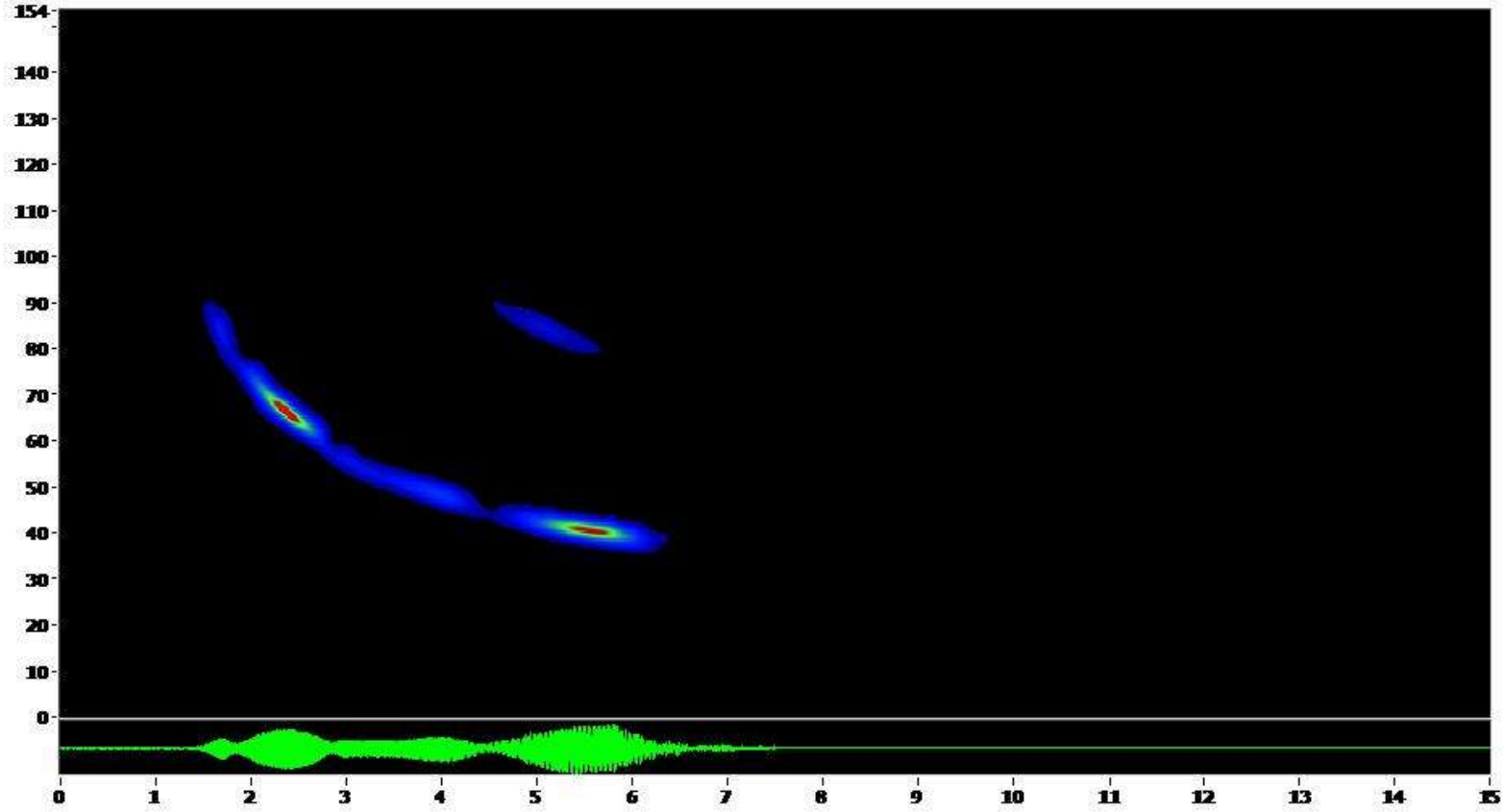


Figure 8. Spectrograph of a little brown bat or occult myotis (*Myotis lucifugus* or *M. occultus*) echolocation call recorded at Escalante Forks on August 5, 2009. This call is a good example of the multiple power centers and "clumpy" appearance of the calls typical of *M. lucifugus*.

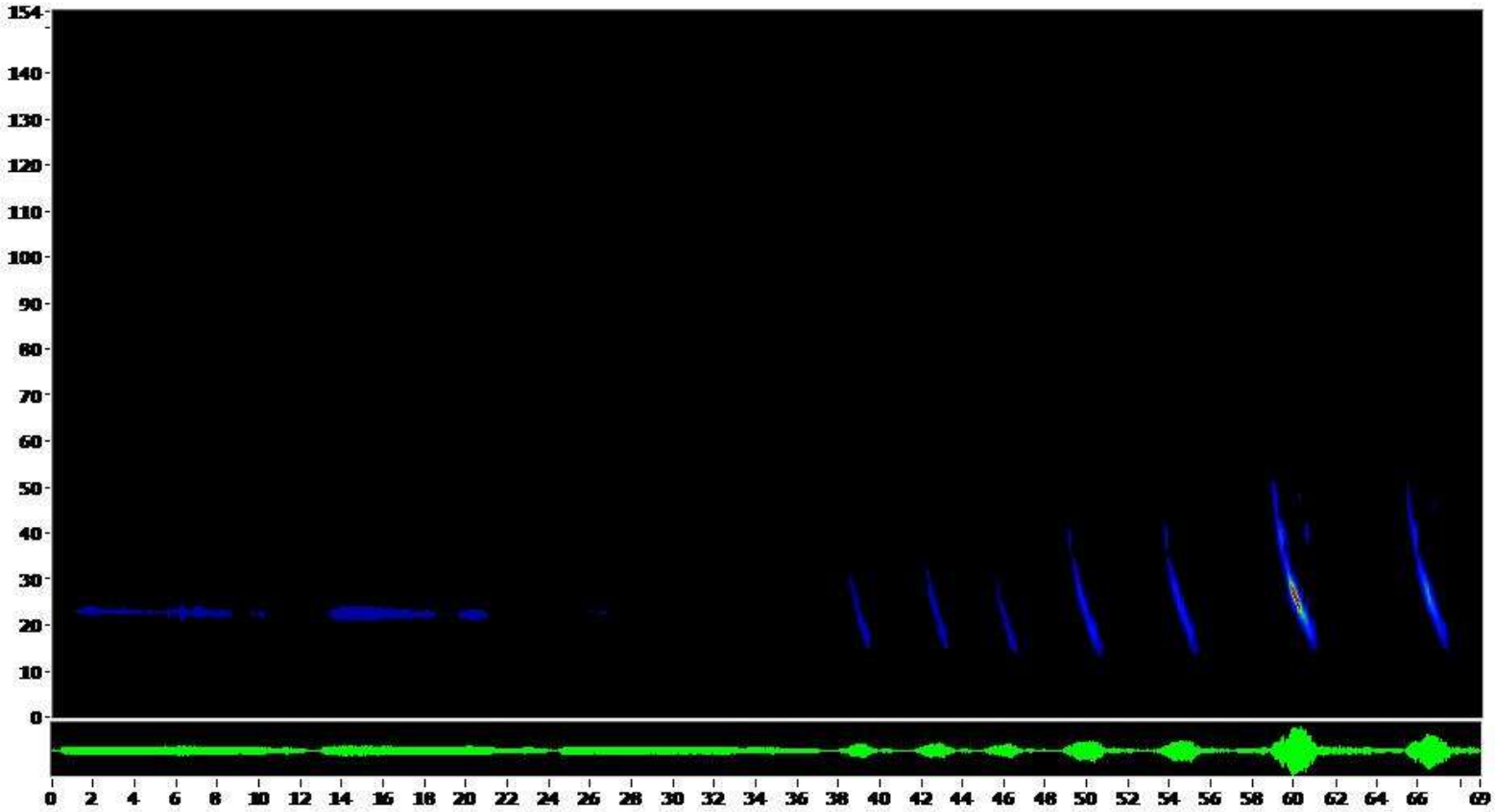


Figure 9. Spectrograph of a fringed myotis (*Myotis thysanodes*) echolocation call sequence recorded at Escalante Forks on August 5, 2009.

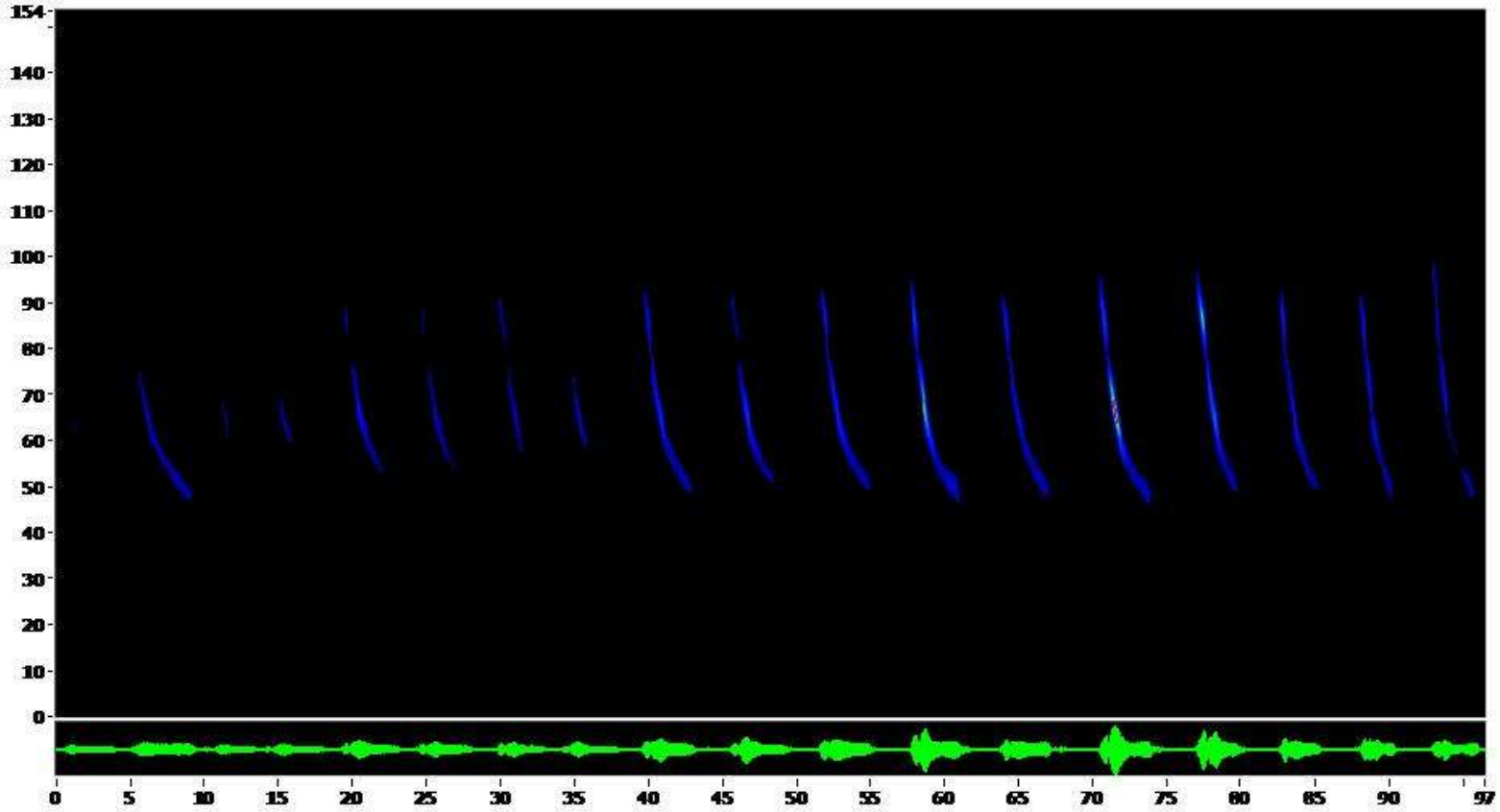


Figure 10. Spectrograph of a Yuma myotis (*Myotis yumanensis*) echolocation call sequence recorded at the Escalante Boat Launch bridge on August 4, 2009.

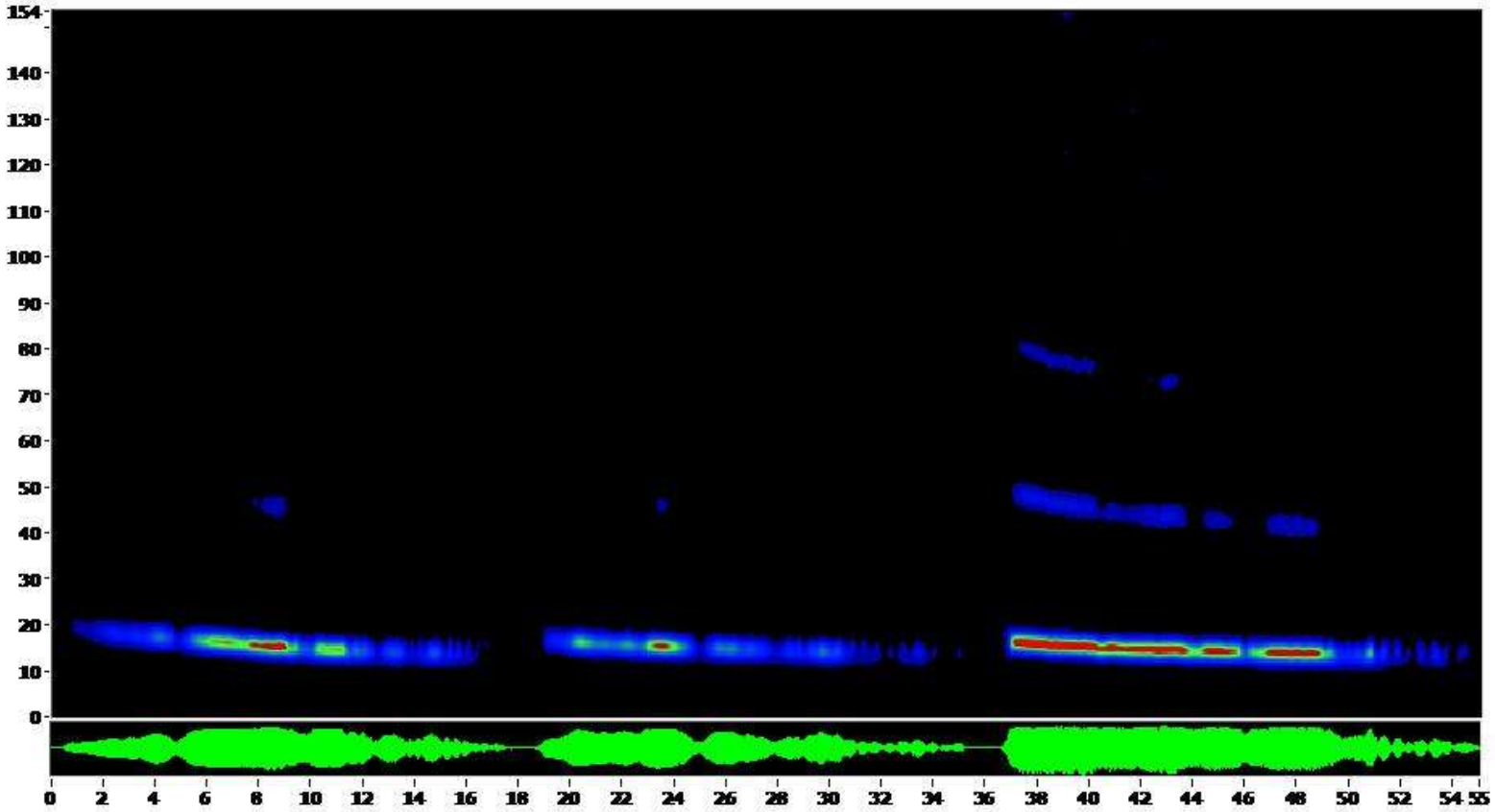


Figure 11. Spectrograph of a presumed big free-tailed bat (*Nyctinomops macrotis*) echolocation call sequence recorded at Big Eddy camp # 2 on July 20, 2009.

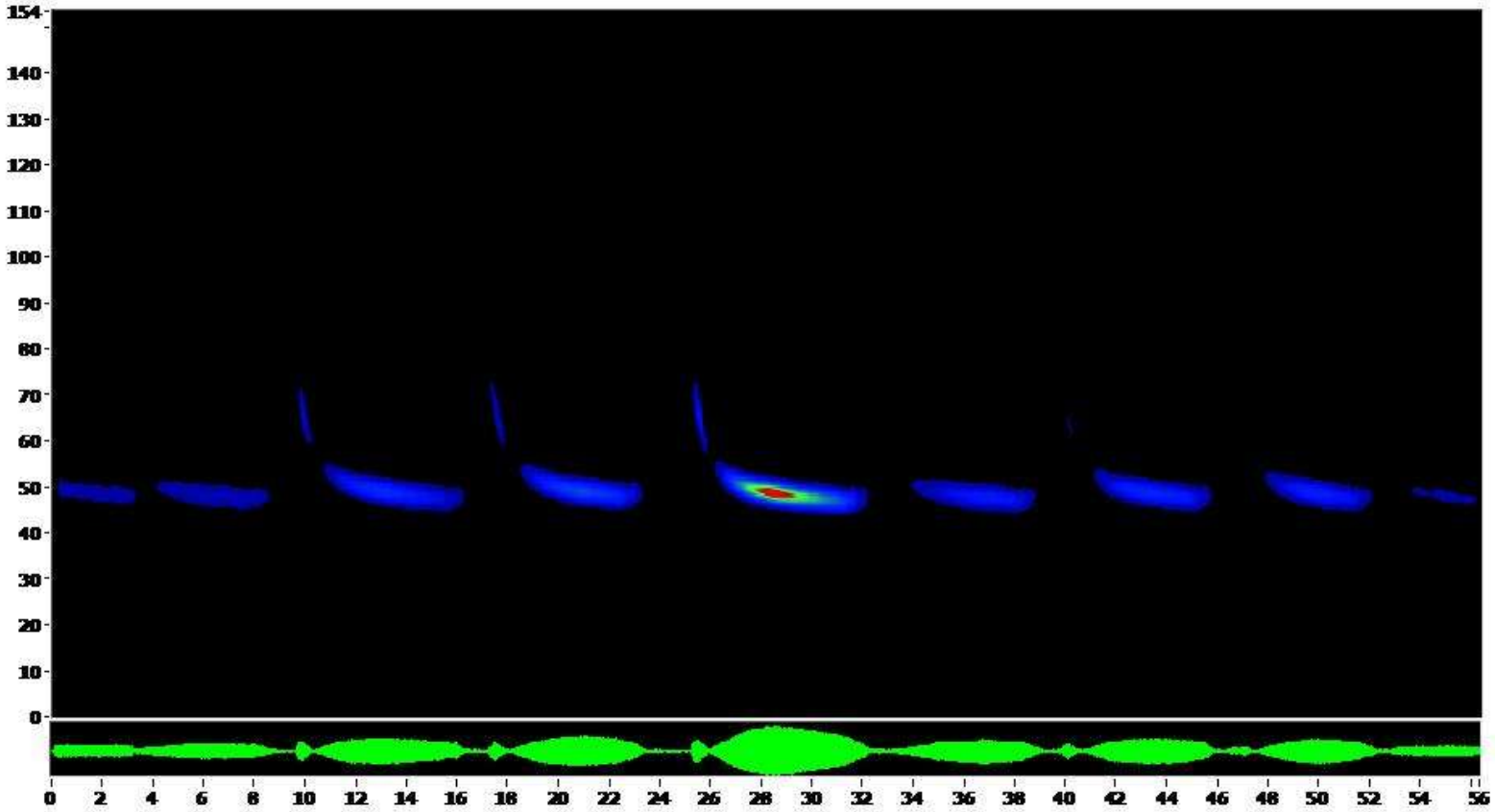


Figure 12. Spectrograph of a western pipistrelle (*Pipistrellus hesperus*) echolocation call sequence recorded at the Escalante Boat Launch bridge on August 4, 2009.

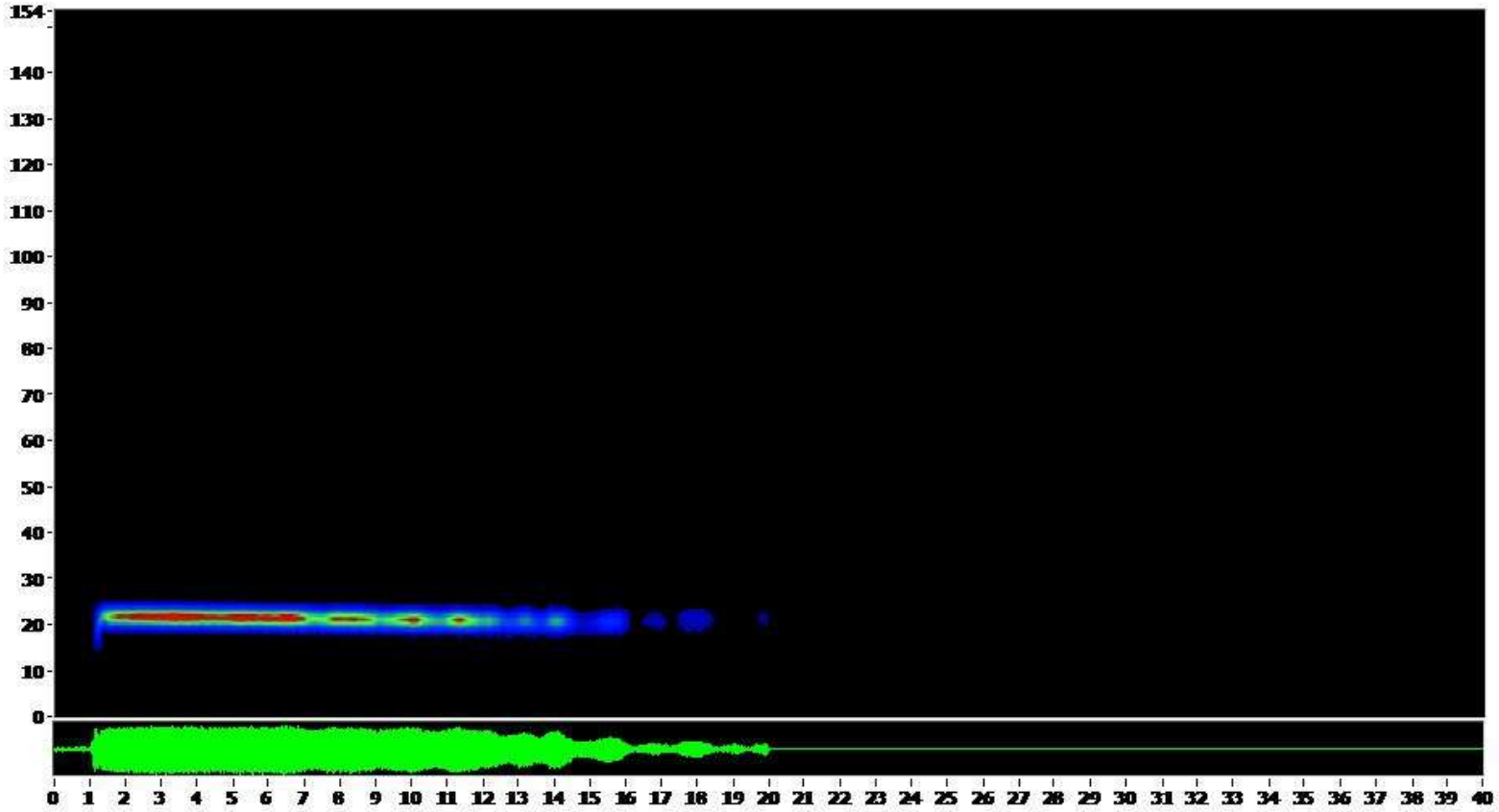


Figure 13. Spectrograph of a Mexican free-tailed bat (*Tadarida brasiliensis*) echolocation call recorded at Escalante Forks on August 5, 2009.

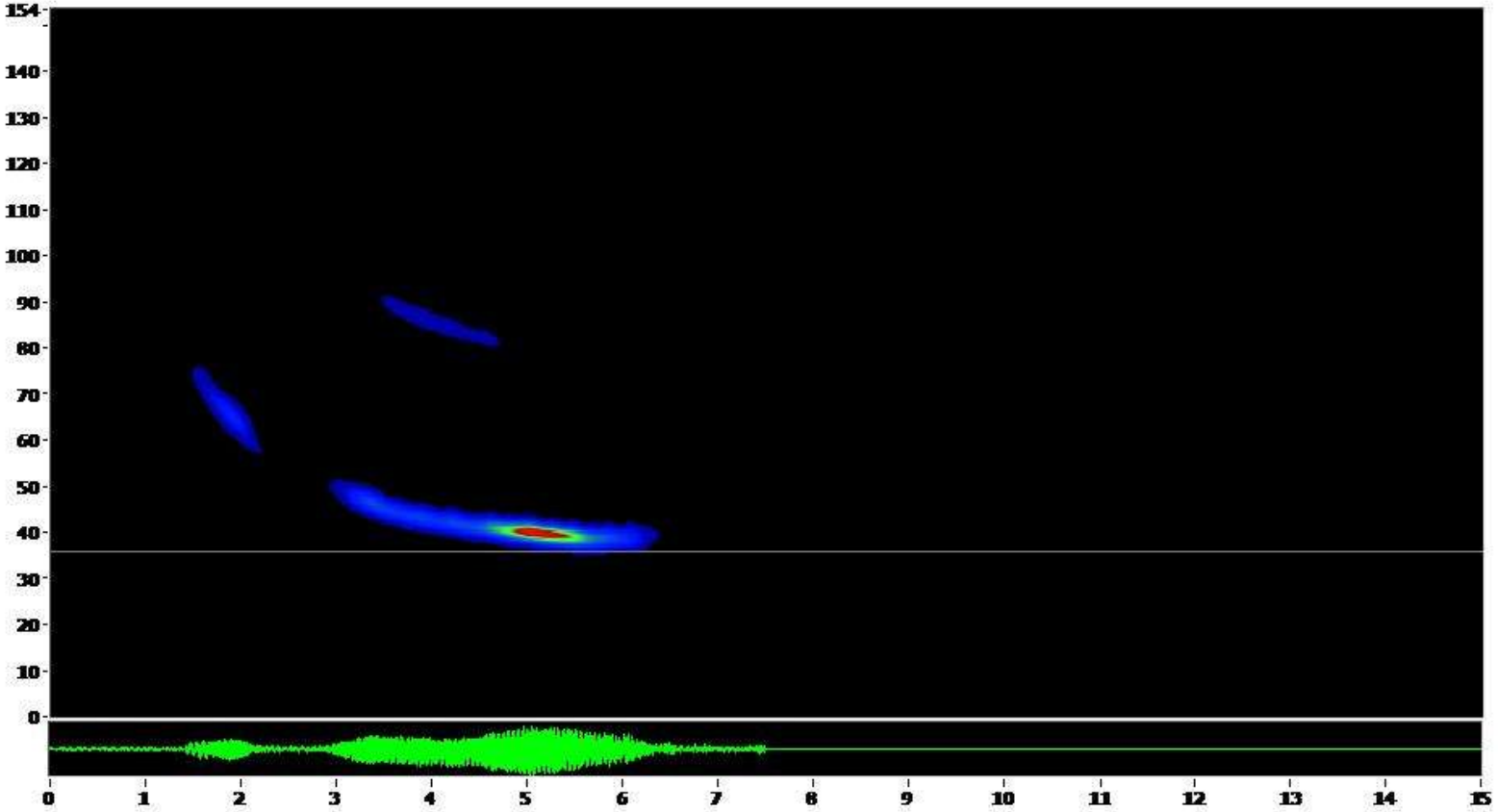


Figure 14. Spectrograph of an unidentified echolocation call recorded at Escalante Forks on August 5, 2009. Of the species known to occur in western Colorado and eastern Utah, this echolocation call, and other similar sequences recorded at Escalante Forks, Smith Fork, and Escalante Boat Launch Bridge, appear consistent with western red bat (*Lasiurus blossevellii*). This species has not been documented in Colorado.

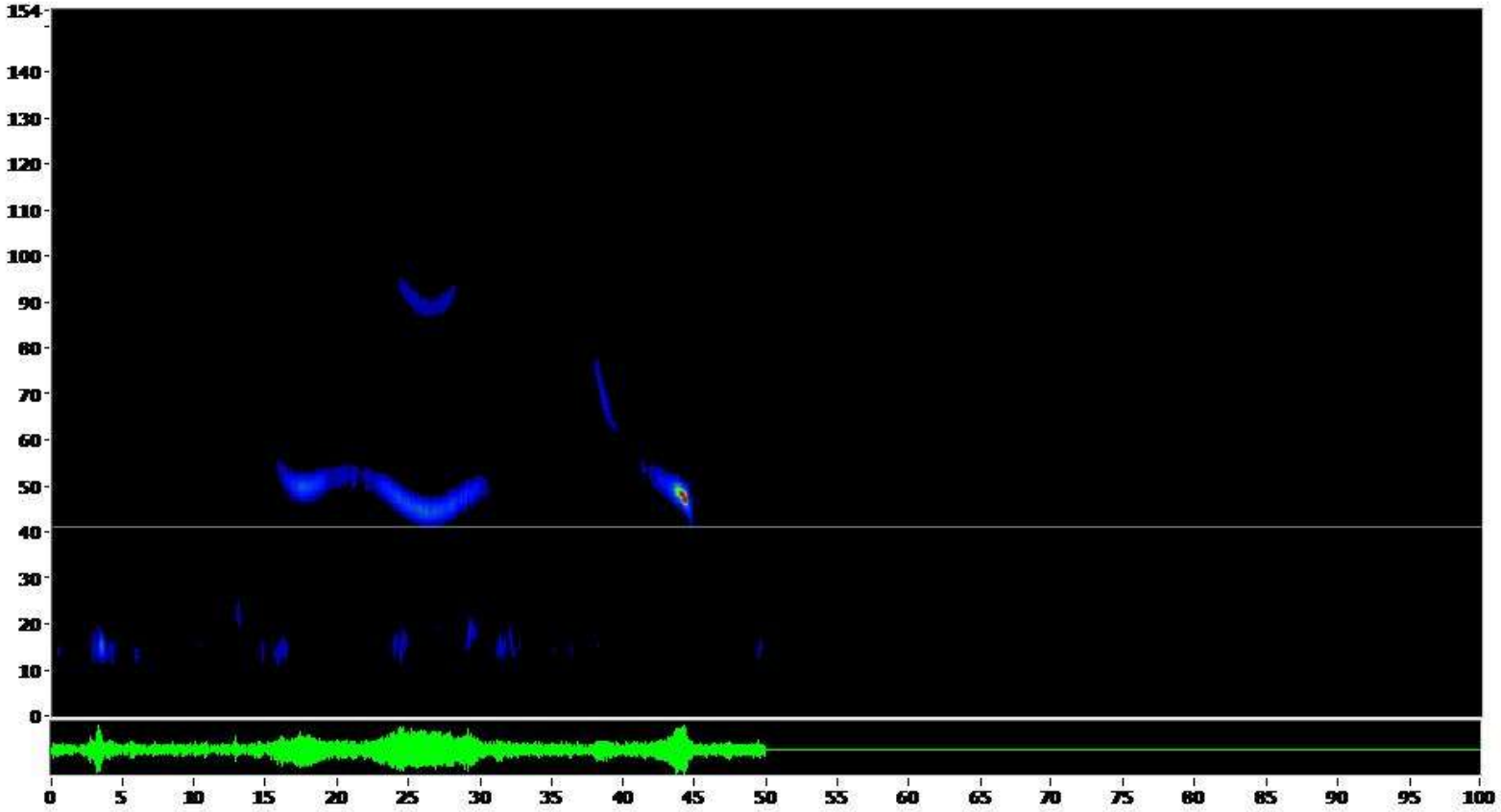


Figure 15. This sequence is likely to be the social call of a Yuma myotis (*Myotis yumanensis)* followed by a *M. yumanensis* echolocation pulse. Recorded at the Escalante Boat Launch bridge on August 4, 2009.

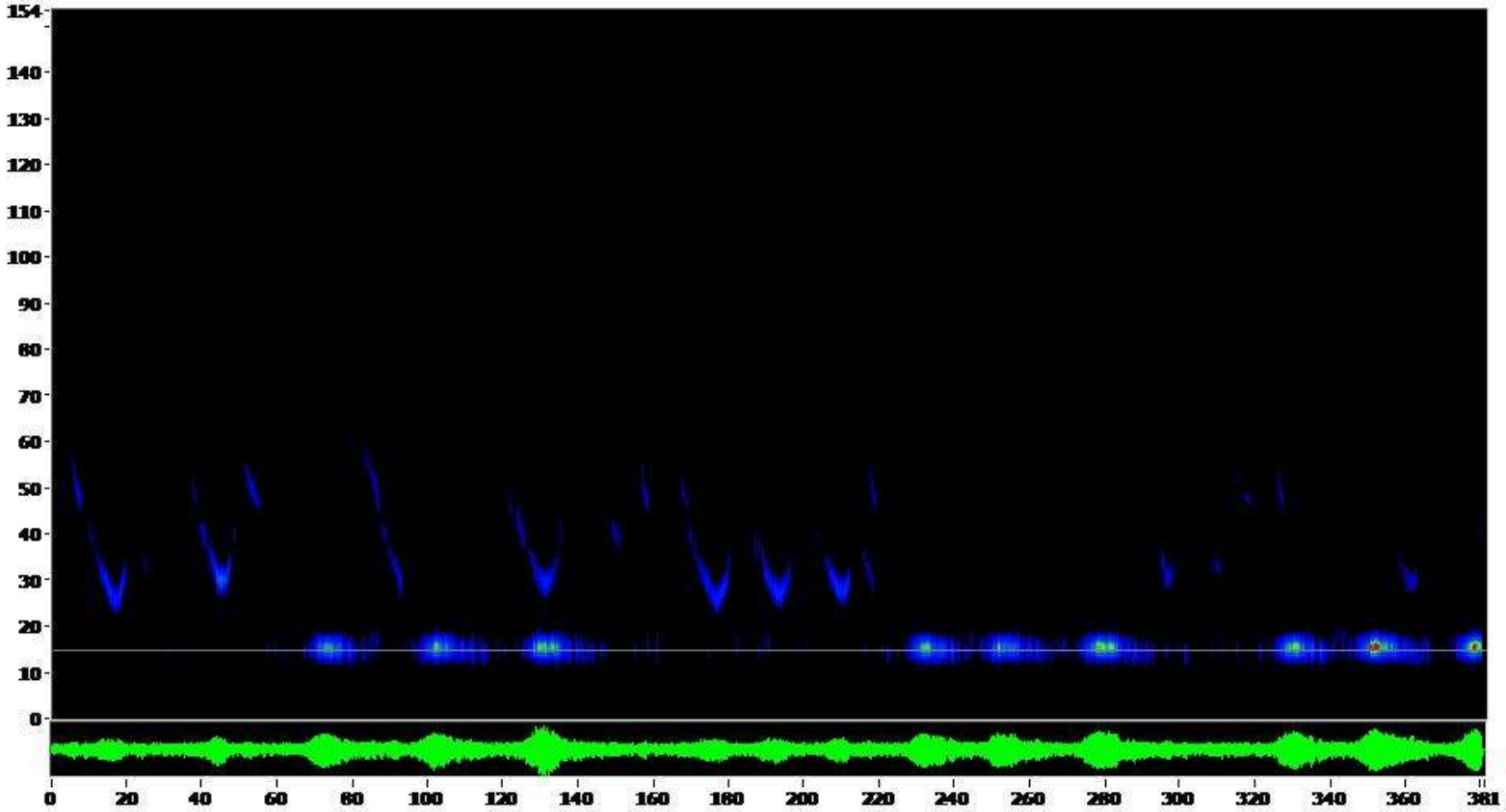


Figure 16. Unidentified ultrasound sequence. This sequence is possibly the social calls of Townsend's big-eared bat (*Corynorhinus townsendii).* The sets of three pulses at 15 kHz are insect sounds. Recorded at Teepee Ranger Camp on July 21, 2009.

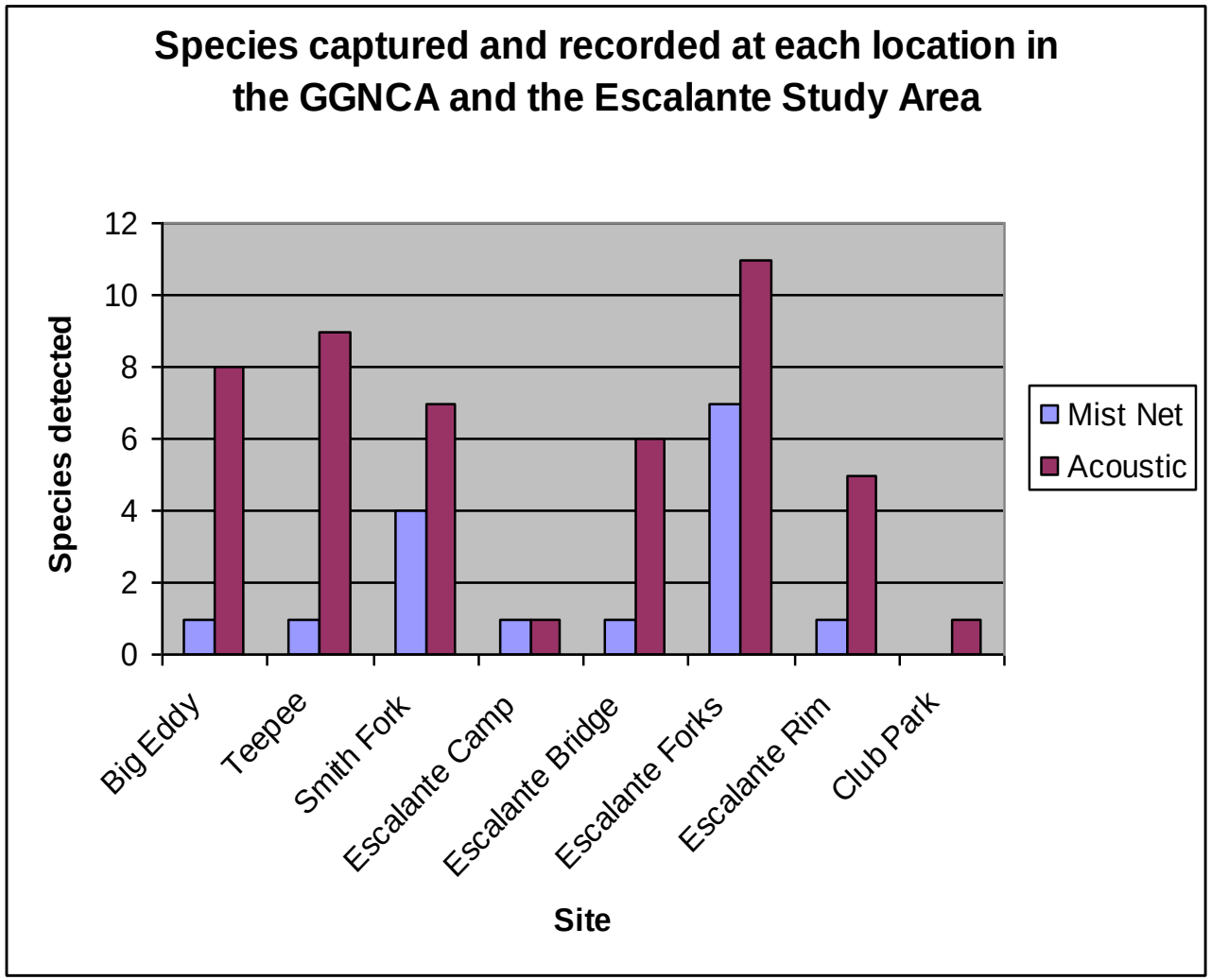


FIGURE 17. Comparing the proportion of bat species captured using mist-netting and recorded using acoustic detections at each location in Gunnison Gorge National Conservation Area and Wilderness and the Escalante study area.

PHOTO 1: A 6-meter mist-net at the Big Eddy site in the Gunnison Gorge National Conservation Area. (Photo by M. A. Hayes).

PHOTOS 2 & 3: The rock outcrop where western pipistrelles were seen down river from Teepee Ranger Camp, Gunnison Gorge National Conservation Area. (Photos by L. R. Bonewell).

PHOTO 4: Two 6-meter nets set at the Smith Fork site at the confluence of Smith Fork and the Gunnison River. (Photo by L. R. Bonewell).

PHOTO 5: View from the Escalante Boat Launch Bridge looking to the northwest. (Photo by M. A. Hayes).

PHOTO 6: View from under the Escalante Boat Launch Bridge, from the boat launch side, looking across the Gunnison River to the southwest. There appears to be a large maternity colony of Yuma myotis using the underside of the bridge, indicated by the white arrow. (Photo by M. A. Hayes).

PHOTO 7: Two 6-meter mist-nets set along the creek at Escalante Forks. (Photo by M. A. Hayes).

PHOTOS 8 & 9: A male Mexican free-tailed bat (*Tadarida brasiliensis*) captured at Escalante Forks. (Photos by M. Hayes).

PHOTO 10: Club Park cattle pond. (Photo by M. A. Hayes).

PHOTO 11: Pettersson D240x bat detector set on a tripod with a iRiver digital mp3 recorder. (Photo by M. A. Hayes).